commodore

COMMODORE BUSINESS MACHINES, INC.
901 CALIFORNIA AVENUE
PALO ALTO, CALIFORNIA 94304
TELEPHONE: (415) 326-4000 TELEX: 345-569
CABLE ADDRESS COMBUSMAC PLA

PIN OUT INFORMATION

USER PORT

| PIN # | LABEL | DESCRIPTION |
|---|---|---|
| 1. | Ground | Digital Ground |
| 2. | T. V. Video | Video output used for external Display, used in diagnostic routine for verifying the video circuit to the display board. |
| 3. | IEEE SRQ | Service request is used by a device to indicate the need for attention or service and to request an interruption of the current sequence of events. Is used in verifying operation of the SRQ in the diagnostic routine. |
| 4. | IEEE EOI | Is used to indicate the end of a multiple byte transfer sequence. This pin verifies the EOI function when running the diagnostic routine. |
| 5. | Diagnostic Sense | When this pin is low system power up the PET software jumps to the diagnostic routine rather than the BASIC routine. |
| 6. | Tape #1 READ | Used with the diagnostic routine to verify cassette tape #1 read function. |
| 7. | Tape #2 READ | Same as cassette #1 except this pin is for cassette #2. |
| 8. | Tape Write | Used inconjunction with the diagnostic routine to verify operation of the WRITE function of both cassette ports. |
| 9. | T. V. Vertical | T. V. vertical output for external display device. Verified in diagnostic. |
| 10. | T. V. Horizontal | T. V. horizontal output for external display device. Verified in diagnostic. |
| 11, 12, A | GND | Digital ground. |
| B | CAI | Is an interrupt and flag input, only from peripherals. (I.e. Handshake for data on PA Port) |
| C | PAØ | Input/Output lines to peripherals, and can be programmed independent of each other for input or output. |
| D | PAI | |

| PIN # | LABEL | DESCRIPTION |
|---|---|---|
| E | PA2 | |
| F | PA3 | |
| H | PA4 | |
| J | PA5 | |
| K | PA6 | |
| L | PA7 | |
| M | CB2 | Can act as a totally independent interrupt as a peripheral control output or a serial input or output. |
| N | GND | Digital ground. |

## Cassete #2 Interface

| | | |
|---|---|---|
| A-1 | GND | Power ground. |
| B-2 | +5 | Positive 5 volts to operate cassette circuitry. |
| C-3 | Motor | Unregulated positive 6 volts to operate cassette motor. |
| D-4 | Read | Read line from cassette. |
| E-5 | Write | Write line to cassette, puts information on tape. |
| F-6 | Sense | Senses. Closure of mechanical switch on cassette when motor is engaged. |

## Memory Expansion Port

All odd pins are grounded. (top side of board)

| | | |
|---|---|---|
| 2B A0 | Buffered | Address Bit 0 used for memory expansion |
| 4B A1 | Buffered | Address Bit 1 used for memory expansion |
| 6B A2 | Buffered | Address Bit 2 used for memory expansion |

| | | | |
|---|---|---|---|
| 8B | A3 | Buffered | Address Bit 3, used for memory expansion. |
| 1Ø | BA4 | Buffered | Address Bit 4, used for memory expansion. |
| 12 | BA5 | Buffered | Address Bit 5, used for memory expansion. |
| 14 | BA6 | Buffered | Address Bit 6, used for memory expansion. |
| 16 | BA7 | Buffered | Address Bit 7, used for memory expansion. |
| 18 | BA8 | Buffered | Address Bit 8, used for memory expansion. |
| 20 | BA9 | Buffered | Address Bit 9, used for memory expansion. |
| 22 | BA1Ø | Buffered | Address Bit 1Ø, used for memory expansion. |
| 24 | BA11 | Buffered | Address Bit 11, used for memory expansion. |
| 26 | NC | | No connection |
| 28 | NC | | No connection |
| 30 | NC | | No connection |
| 32 | NS1 | Active low | Address select for locations 1000-1FFF |
| 34 | NS2 | Active low | Address select for locations 2000-2FFF |
| 36 | NS3 | Active low | Address select for locations-3000-3FFF |
| 38 | NS4 | Active low | Address select for locations 4000-4FFF |
| 40 | NS5 | Active low | Address select for locations-5000-5FFF |
| 42 | NS6 | Active low | Address select for locations 6000-6FFF |
| 44 | NS7 | Active low | Address select for locations 7000-7FFF |
| 46 | NS9 | Active low | Address select for locations 9000-9FFF |
| 48 | NSA | Active low | Address select for locations A000-AFFF |
| 50 | NSB | Active low | Address select for locations B000-BFFF |
| 52 | NC | | No connection |
| 54 | $\overline{\text{RES}}$ | | Resets microprocessor. |
| 56 | IRQ | | Interrupt request line to the microprocessor. |
| 58 | BØ2 | | Buffered phase 2 clock. |
| 6Ø | BR/W | | Buffered read or write enable. |
| 62 | NC | | No connection. |
| 64 | NC | | No Connection |

| | | |
|---|---|---|
| 66 | BDØ | Buffered date bit Ø |
| 68 | BD1 | Buffered date bit 1 |
| 70 | BD2 | Buffered date bit 2 |
| 72 | BD3 | Buffered date bit 3 |
| 74 | BD4 | Buffered date bit 4 |
| 76 | BD5 | Buffered date bit 5 |
| 78 | BD6 | Buffered date bit 6 |
| 80 | BD7 | Buffered date bit 7 |

## IEEE-488 INTERFACE

| | | |
|---|---|---|
| 1 | DIO1 | Data input/output bit Ø |
| 2. | DIO2 | Data input/output bit 1 |
| 3. | DIO3 | Data input/output bit 3 |
| 4. | DIO4 | Data input/output bit 3 |

### The Transfer Bus

A handshake sequence is executed by the talker and the listeners over the Transfer Bus time a data byte is transferred over the Data Bus. The transfer Bus signal lines are defined as follows:

| | Signal | Definition |
|---|---|---|
| 7. | Not Ready for Data (NRFD) | An active low NRFD signal line indicates that one or more assigned listeners are not ready to receive the next data byte. When all of the assigned listeners for a particular data transfer have released NRFD, the NRFD line goes inactive high. This tells the talker to place the next data byte on the Data Bus. |
| 6. | Data Valid (DAV) | The DAV line is activated by the talker shortly after the talker places a valid data byte on the Data Bus. An active low DAV signal tells each listener to capture the data byte presently on the Data Bus. The talker is inhibited from activating DAV when NRFD is active low. |

| | Signal | Definition |
|---|---|---|
| 8. | Data Not Accepted (NDAC) | The NDAC signal line is held active low by each listener until the listener captures the data byte, NDAC goes inactive high. This tells the talker to take the byte off the Data Bus. |

Management Bus

The Management Bus is a group of signal lines which are used to control data transfers over the Data Bus. The signal definitions for the Management Bus are as follows:

| | Signal | Definition |
|---|---|---|
| 9. | Interface Clear (IFC) | The IFC signal line is activated by the PET when it wants to place all interface circuitry in a predetermined quiescent state. |
| 10. | Service Request (SRQ) | Any peripheral device can request the attention of the PET by setting SRQ active low. The PET responds by setting ATN active low and executing a serial poll to see which device is requesting service. |
| 5. | EOI | Is used to indicate the end of a multiple byte transfer sequence. |
| 11. | Attention (ATN) | This signal is activated by the PET when peripheral devices are being assigned as listeners and talkers. Only peripheral addresses and control messages can be transferred over the Data Bus when ATN is active low. After ATN goes high, only those peripheral devices which are assigned as listeners and talkers can take part in the data transfer. |
| 12. | Chasis ground | Ground line to ground the chasis together. |
| A. | DIO5 | Data input/output bit 4. |
| B. | DIO6 | Data input/output bit 5. |
| C. | DIO7 | Data input/output bit 6. |
| D. | DIO8 | Data input/output bit 7. |
| E. | N GND | Digital grounds. |

## Connectors

| | | |
|---|---|---|
| Connector | J1 | Display connector |
| | J2 | Keyboard connector |
| | J3 | Cassette #1 connector |
| | J4 | Memory expansion connector |
| | J5 | User Port connector |
| | J6 | Cassette #2 connector |
| | J7 | IEEE-488 connector |

| | | | |
|---|---|---|---|
| PIA | 6520 | UG8 | |
| PIAL | | $E810 | 59408 |
| PIAL1 | | $E811 | 59409 |
| PIAK | | $E812 | 59210 |
| PIAS | | $E813 | 59411 |
| PIA | 6520 | UB8 | |
| IEE1 | | $E820 | 59424 |
| IEEIS | | $E821 | 59425 |
| IEEO | | $E822 | 59426 |
| IEEOS | | $E823 | 59427 |
| VIA | 6522 | VA5 | |
| PIA | | $ E840 | 59456 |
| SYNC | | $ E841 | 59457 |
| P2DB | | $ E842 | 59458 |
| P2DA | | $ E843 | 59459 |
| TIL | | $ E844 | 59460 |
| TIH | | $ E845 | 59461 |
| TILL | | $ E846 | 59462 |
| TILH | | $ E847 | 59463 |
| T2L | | $ E848 | 59464 |
| T2H | | $ E849 | 59465 |
| SR | | $ E84A | 59466 |
| ACR | | $ E84B | 59467 |
| PCR | | $ E84C | 59468 |
| IFR | | $ E84D | 59469 |
| IER | | $ E84E | 59470 |
| SYNC1 | | $ E84F | 59471 |

| SYMBOLIC NAME | HEX ADDRESS | DECIMAL |
|---|---|---|

PIAL

| | | |
|---|---|---|
| ∅ | O | A |
| 1 | O | B keyboard decode |
| 2 | O | C |
| 3 | O | D |
| 4 | I | #1 Cassette on switch |
| 5 | I | #2 Cassette on switch |
| 6 | I | EOI input from IEEE 488 |
| 7 | I | Diagnostic jumper sense |

PIAL1

| | | |
|---|---|---|
| 3 | O | Blank to TV display |

PIAK

| | | |
|---|---|---|
| ∅ | I | |
| 1 | I | |
| 2 | I | |
| 3 | I | INput from |
| 4 | I | keyboard |
| 5 | I | scan |
| 6 | I | |
| 7 | I | |

PIAS

| | | |
|---|---|---|
| 3 | O | #1 cassette motor control |

| | | |
|---|---|---|
| | | NOITPIRCSED |
| | NOITCETRID | |
| TIB | | |

IEE1

| | | | |
|---|---|---|---|
| 0 | I | DI1 | |
| 1 | I | DI2 | |
| 2 | I | DI3 | |
| 3 | I | DI4 | in from IEEE |
| 4 | I | DI5 | data lines |
| 5 | I | DI6 | |
| 6 | I | DI7 | |
| 7 | I | DI8 | |

IEEIS

| | | | |
|---|---|---|---|
| 3 | 0 | $\overline{\text{NDAC}}$ | to IEEE |

IEEO

| | | | |
|---|---|---|---|
| 0 | 0 | DO1 | |
| 1 | 0 | DO2 | |
| 2 | 0 | DO3 | |
| 3 | 0 | DO4 | Out to IEEE |
| 4 | 0 | DO5 | data lines |
| 5 | 0 | DO6 | |
| 6 | 0 | DO7 | |
| 7 | 0 | DO8 | |

IEEOS

| | | | |
|---|---|---|---|
| 3 | 0 | $\overline{\text{DAV}}$ | to IEEE |

| SYNC | or | SYNC1 | (See 6522 spec) |
|---|---|---|---|
| 0 | | I/O | |
| 1 | | I/O | |
| 2 | | I/O | |
| 3 | | I/O | |
| 4 | | I/O | User port |
| 5 | | I/O | |
| 6 | | I/O | |
| 7 | | I/O | |

| PIA | | |
|---|---|---|
| 0 | I | $\overline{\text{NDAC}}$ |
| 1 | O | $\overline{\text{NRFD}}$ |
| 2 | O | $\overline{\text{ATN}}$ |
| 3 | O | Cassette write |
| 4 | O | #2 cassette motor |
| 5 | I | Display on (sync) |
| 6 | I | $\overline{\text{NRFD}}$ |
| 7 | I | DAV |

| PCR | | |
|---|---|---|
| 3 | O | Bus or graphics character set |

| ACR | | |
|---|---|---|
| 3 | I/O | User port serial line. |

I/O checkout

JF 10-28-77

1 UG8 - keyboard test

a. plug in a working keyboard

b. type the following sequence of characters and verify that they appear on the screen:

```
! " # $ % 1 & / ( ) ←
Q W E RT YU I O P ↑
A S D F G H J K L :
Z X C V B N M , ; ?
@ [ ] < >
7 8 9 / 456 * 1 2 3 + 0 . - =
```

[SPACE] [RETURN]

PET should respond with

```
? SYNTAX ERROR
READY.
```

c. type this line

? " [CLR HOME] [CURSOR ↓] [CURSOR →] [OFF RUS] AAA [RETURN]

SHIFT

Screen should clear and

[AAA]

READY.

be printed

d. if keyboard does not work

i recheck UG8 for bent pins

ii replace UG8

iii inspect for shorts near
UG9 - UG8 -J5

2. UG8 - UA5- Cassette test

a. built in cassette motor
should be off.

b. verify cassette motor operation
by pressing PLAY , REWIND ,
and FAST FORWARD

c. if built in cassette problem

i recheck UG8 for bent pins

ii replace UG8

iii check Q1 - Q6

d. plug in second cassette

e. verify cassette motor operation
Motor should only run when
PLAY , REWIND , & FAST FORWARD
are pressed.

f. if 2nd cassette problem then
go to step C and check UA5

3. CA2 UB5 TEST

a. type

POKE 59409 , 52

the TV display should go blank

b. reset the PET

c. type

ZZZ CURSOR

POKE 59468 , 14 R
E
T
U
R
N

THE ROW OF CHARACTERS SHOULD CHANGE TO

zzzZZZ

4. UB8 - UA7 - UA9

a) Using a voltmeter on 5-10 volt range check pins on J1 to make sure only 1 pin at a time is high. Black wire to ground. Red to test pins 1,2,3,4,13,14,15,16

| | | | | | |
|---|---|---|---|---|---|
| POKE | 59426, | 1 | only pin | 1 | high |
| | " | 2 | " | 2 | " |
| | | 4 | | 3 | |
| | " | 8 | " | 4 | |
| | | 16 | | 13 | " |
| | | 32 | | 14 | |
| | " | 64 | " | 15 | " |
| | | 128 | | 16 | |

b) Type in this program:

```
1Ø   POKE  59426, 255
2Ø    ? PEEK (59424)  :  GOTO 2Ø
RUN
```

ground this pin

| on J1 | See this number on screen |
|---|---|
| 1 | 254 |
| 2 | 253 |
| 3 | 251 |
| 4 | 247 |
| 13 | 239 |
| 14 | 223 |
| 15 | 191 |
| 16 | 127 |

5. User port test UA5

a) Reset machine

b) type in this program

```
1Ø  ?  PEEK  (59471)  :  GOTO  1Ø
RUN
```

| ground this pin on J2 | See this number on screen |
|---|---|
| C | 254 |
| D | 253 |
| E | 251 |
| F | 247 |
| H | 239 |
| J | 223 |
| K | 191 |
| L | 127 |

c) Attach black lead of voltmeter to ground. Test pins on J2:
C,D,E,F,H,J,K,L

type

| | | | | |
|---|---|---|---|---|
| POKE | 59471 , 1 | only | C | high |
| " | 2 | " | D | " |
| | 4 | | E | |
| | 8 | | F | |
| " | 16 | " | H | " |
| | 32 | | J | |
| " | 64 | " | K | " |
| | 128 | | L | |